



GOVERNMENT OF INDIA
MINISTRY OF TOURISM AND CIVIL AVIATION
(COMMISSION OF RAILWAY SAFETY)

RAILWAY ACCIDENT INVESTIGATION REPORT

On
Collision
Of
No. B. 19 Down Local Train
With
No. M. 9 Down Local Train
between
Vadala Road and Ravli Jn Cabin
Central Railway
On
28th June, 1966

C O R R I G E N D U M

Page No.	Para No.	Line No.	For	Read
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SUMMARY

Date	28th June, 1966.
Time	08.05 hours.
Railway	Central.
Gauge	Broad Gauge, 5'-6".
Location	At Km. 9/19-20 on Harbaour Branch Electric Suburban between Vadala Road Station and Ravli Jn. Cabin.
Nature of accident	Collision of a Local Train with rear of another stationary Train.
Trains involved	B. 19 Down Suburban Train and M. 9 Down Suburban Train.
Consisting of	B. 19 Down : Two EMU's— 8 Coaches. M. 9 Down : Two EMU's— 8 Coaches.
Estimated Speed.	B. 19 Down : About 25 Km. p.h. M. 9 Down : Stationary.
System of operation	Automatic Block System with 3-aspect Colour Light Signals.
No. of tracks	Double line Section.
Gradient	1 in 650 rising.
Alignment	2½° Left-hand Curve.
Weather	Cloudy.
Visibility	Clear.
Casualties	43 persons injured of whom 12 were classified as grievous.
Cause	B. 19 Down Suburban Train being driven without requisite care in contravention of the provisions in General Rules 277, 279 and 76.
Persons held responsible	Motorman of B. 19 Down Suburban Train.

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GOVERNMENT OF INDIA
MINISTRY OF TOURISM & CIVIL AVIATION
(COMMISSION OF RAILWAY SAFETY)

From :

The Additional Commissioner of Railway Safety, Western Circle,
Government of India Offices, Queen's Road, Bombay-1.

To :

The Secretary to the Government of India, Ministry of Transport & Aviation,
New Delhi.

Through.—The Commissioner of Railway Safety, Lucknow.

Sir,

In accordance with Rule 11 of Railway Board's Notification No. 59-TTV/42/1 dt. 17-4-66, I have the honour to report the Results of my Inquiry into the Collision of No. B. 19 Down Local Train with No. M. 9 Down Local Train between Vadala Road and Ravli Jn. Cabin on the Harbour Branch Electric Suburban of Bombay Division, Central Railway, at about 08.05 hours on 28th June, 1966.

2. Inspection and Inquiry.—(a) On 28th June, in company with the Chief Signal & Telecommunication Engineer, the Chief Operating Superintendent, the Divisional Superintendent and Officers of Bombay Division, I inspected—

The Site of the Accident and damaged Electric Multiple Units of the B. 19 and M. 9 Down Trains ;

The Signalling Installations in Ravli Jn. Cabin; and

The Signalling Section between Vadala Road and Ravli Jn. routing signals, including the installations at Level-crossings No. 5 and No. 4.

Based on the field survey, I desired preparation of scale-drawings.

(b) After inspection of the Site, I met the Driver, known as Motorman on EMU's, of B. 19 Down, who was admitted in the Central Railway Hospital at Byculla, with a view to assess the circumstances that led up to the Collision. The Motorman requested that he may be allowed to give his written statement after 4 or 5 days. He had received abrasions on both legs, and an X-ray examination showed a crack in the left scapula.

On 29th June, in company with the Chief Medical Officer and Medical Superintendent of the Central Railway, I visited the casualties of the accident in the Lokmanya Tilak Municipal General Hospital at Sion and the Central Railway Hospital at Byculla, and was satisfied in respect of the care and attention given to the injured.

(c) A Press Notification was issued on 28th June inviting the public who had information bearing on the Accident to appear at the Inquiry, which I commenced on 1st July 1966, in the Divisional Superintendent's Office, Bombay VT, or to communicate with me by Post.

The District Magistrate and the Superintendent of Police, Dadar, were duly notified. The Officers present at the Inquiry were :—

Shri P. N. Kaul Divisional Superintendent, Central Railway, Bombay.

Shri R. P. Singh Transportation Superintendent (Safety), Central Railway Headquarters, Bombay.

Shri H. G. S. Rao Divisional Signal & Telecommunication Engineer, Central Railway Headquarters, Bombay.

Shri R. A. McGready Divisional Safety Officer, Bombay Division.

Shri Brij Kishore Sub-divisional Police Officer, Railways, Dadar.

The evidence of 23 witnesses has been recorded and relevant exhibits filed.

(d) Due to his medical condition, I was obliged to record the evidence of Motorman of B. 19 Down in short spells from 4th to 7th July. This completed, on 7th July I took him with me in the driving cab of a train of the same composition as the B. 19 Down from Vadala Road to Ravli Junction to appreciate and discuss with him the essential facets of his evidence.

Note : In this Report :

the terms 'right'/'left', 'leading'/'trailing' and 'front'/'rear', where used in respect of each train, are in reference to its direction of travel;

the terms 'in advance of'/'in rear of' in relation to a signal or location are used in defining a position on the line beyond/before reaching the signal or location as seen from an approaching train;

the abbreviation 'B. 19' is used for B. 19 Down Suburban Train.

the abbreviation 'M. 9' is used for M. 9 Down Suburban Train.

the abbreviation 'VDLR Signal' is used for Vadala Road down starting signal.

the abbreviation 'RVJ1 Signal' is used for Ravli Jn. down routing signal No. 1 referring to the straight route.

the abbreviation 'RVJ2 Signal' is used for Ravli Jn. down routing signal No. 2 referring to the Bandra Chord.

the abbreviation 'E.M.U.' is used for Electric Multiple Unit which in this case comprised 4 coaches.

the abbreviation 'E.S.' is used for Electric Structure.

the abbreviation 'Jn.' is used for Junction.

3. **The Accident.**—(a) The B. 19 Down Local Train, which started from Vadala Road on Red Signal and the 'A' marker light, collided, about 580 yards ahead, with the rear of the M. 9 Down Local Train which stood with its leading end on the straight and trailing end on the left-hand curve of the track-circuited section waiting for clearance of the Ravli Jn. routing signal. Each Train consisted of 8 coaches, i.e. two E.M.U's. The Accident occurred at about 08.05 hours on 28th July 1966 when the weather was cloudy and the visibility was clear. The working of trains on the Harbour Branch double-line suburban section is on the Automatic Block System with 3-aspect colour light signals, a few of which are semi-automatic.

The Collision resulted in—

the front Coach of B. 19 Down and the rear coach of M. 9 Down telescoping to a depth of about 13', smashing of cabs and portions of adjoining compartments, and the underframe of the latter, dislodged of its trailing trolley, forcing square, into the former at floor level; and the contiguous ends of the 1st and 2nd coaches of B. 19 Down being crushed to an extent of 4'-3", and the rear end of the former lifting off its trailing trolley.

Fortunately there was no fatal casualty. It appeared certain that had the Motorman of B. 19 Down been at the controls in the driving cab and survived, he would have been most grievously injured. The damage done in the Collision was, in my view, consistent with an impact speed of the order of 25 Km. p.h.

4. **Casualties.**—As a result of the accident, 42 passengers received injuries, 11 being classified as grievous. In addition the Motorman of B. 19 Down was grievously injured as mentioned in para 2(b).

II. RELIEF MEASURES

5. **Intimation.**—The Control at Bombay V.T. received intimation of the Accident from Ravli Jn. Cabin in 5 minutes of its occurrence and alerted all concerned at Headquarters and on the Division.

The Station Master, Vadala Road, who was informed of the collision in a minute of its occurrence by the gateman of level-crossing No. 4, telephoned for assistance to the Fire Brigade and Police Stations.

6. **Assistance at Site.**—(a) Crews of the Fire Brigade and one ambulance, in charge of Shri N. V. Chitnis, Station Officer, Dadar "Fire Station", reached the Site at 08.13 hours.

The Chief Officer of the Bombay Fire Brigade, who arrived on the scene soon after, directed all rescue operations.

A road bus was vacated and the first batch of injured persons was transported to Sion Hospital.

(b) Some time later, the following reached the Site :—

Ambulances from other "Fire Stations";

Ambulances with doctors and staff, one from Sion Hospital and one from KEM Hospital;

Civil Defence personnel with 2 ambulances and staff;

Central Railway ambulance from Byculla with 2 doctors and staff;

The Chief Medical Officer, the Medical Superintendent, the Divisional Medical Officer, other doctors and staff of Central Railway.

(c) In 45 minutes of the occurrence of the Accident, all the injured, some of whom were rendered first aid at the Site, were transported and admitted in the Tilak Hospital at Sion and Central Railway Hospital at Byculla.

The Motorman of B. 19 Down was taken by the Divisional Medical Officer in an ambulance and admitted in the railway hospital at Byculla by 09.15 hours.

7. **Restoration of Lines.**—After my inspection of the Site, clearance operations were commenced at about 11.00 hours using brake-down equipment and a diesel engine requisitioned from Kurla. After disengaging the locked buffers, the coaches concerned were mounted on their respective trollies and the rakes worked into Kurla Car Shed by the diesel engine. The down line was restored to normal traffic at 14.30 hours.

III. THE TRAINS

8. **The E. M. U's.**—(a) The M. 9 Down from Bombay VT to Mankhurd, *via* Ravli Jn. and Kurla Jn. and the B. 19 Down from Bombay VT to Bandra *via* Ravli Jn., each consisted of two 4-coach sets. The second bogie of each 4-coach set was motored. The length of each train was 573 feet and the tare weight was 359 Tons. Each train was fully vacuum-braked, and the assessed brake power was 332 Tons.

(b) The coaches were wood-bodied with steel panelling, mounted on steel underframes with side-buffers and screw couplings. The maximum seating and standing capacity of each train was about 1,300. The approximate number of passengers in the M. 9 Down and the B. 19 Down was assessed to be 675 and 610 respectively.

(c) The composition of the 10' wide EMU's, of English Electric manufacture, was as under :—

Coach No. & type	Year commissioned	Year rehabilitated
(i) B. 19 Down :		
0-8628 Trailer Coach IIIrd YT	1923	1961
8547 Motor Coach YTLZZ	1928	1956
8222 Trailer Coach IIIrd YT	1940	..
0-8030 Trailer Coach 1st & IIIrd YFYTY	1938	..
8631 Trailer Coach IIIrd YT	1925	1961

Coach No. & type	Year commis- sioned	Year reha- bilitated
8538 Motor Coach YTLZZ	1928	1956
8232 Trailer Coach IIIrd YT	1939	..
o-8039 Trailer Coach Ist & IIIrd YFYTY	1937	..
(ii) <i>M. 9 Down</i> :		
8630 Trailer Coach IIIrd YT	1938	..
8529 Motor Coach YTLZZ	1928	1956
8229 Trailer Coach IIIrd YT	1938	..
o-8018 Trailer Coach Ist & IIIrd YFYTY	1923	1961
8646 Trailer Coach IIIrd YT	1939	..
8532 Motor Coach YTLZZ	1928	1955
8215 Trailer Coach IIIrd YT	1939	..
8036 Trailer Coach Ist & IIIrd YFYTY	1939	..

9. Damage.—There was no damage to the permanent way, the signalling or the overhead traction equipment. The damage to Rolling Stock was as under :—

B. 19 Down : (i) Ist Coach No. O-8628, driving trailer: Rear end lifted by 1'—9", and dislodged trailing trolley moved forward on rails by 2'—2". Underframe at both ends bent. Superstructure smashed to an extent of about 9' at front end and 3' at rear end.

(ii) 2nd Coach No. 8547, motored: Underframe and superstructure damaged at front end to an extent of 2'.

(iii) 6 Coaches, 3rd to 8th : Undamaged and intact on track.

M. 9 Down : (i) 8th Coach No. 8036, driving trailer : Rear end lifted up, and dislodged trailing trolley moved forward on rails by 20'. Underframe at rear end slid over that of 1st coach of *B. 19 Down* and bent. Superstructure smashed to an extent of 5'. सत्यमेव जयते

(ii) 7 coaches, 1st to 7th : Undamaged and intact on the track.

The damage to the E.M.U's has been estimated to be about Rs. 40,000/-.

IV. LOCAL FEATURES AND SIGNALLING

10. The Section and the Site.—(a) The kilometrage, reckoned from Bombay VT of stations on the Harbour Branch Suburban, referred in this Report are as below, there being 15 to 24 electric structures per kilometre :—

Bombay VT	Km. Zero
Vadala Road Station	ES. 9/2-3
Site of Accident	ES. 9/19-20
Ravli Jn. Cabin	Km. 10.06
Kurla Jn.	Km. 15.29
Mankhurd	Km. 17.70
King's Circle (Bandra Chord)	Km. 10.86
Bandra (on Western Railway)	Km. 14.08

The general direction of the double line Harbour Branch section from Bombay VT to Ravli Jn., i.e. the down direction, is northerly. On the west of the railway boundary between Vadala Road and Ravli Jn. is the Rafi Ahmed Kidvai main road. By road, the Sion Hospital and the railway Hospital at Byculla are 160 and 640 kilometres respectively from the Site where the accident occurred.

(b) Facing Ravli Jn. the 2 lines from left to right are the down and the up local lines, laid not less than 15'-6" centre to centre. The permanent way consists of 105 lbs. rails, each 42' in length, welded in panels of 5 rail-lengths, laid on wood sleepers to N+6 density over stone ballast at 12 to 16 cft. per foot run. Subject to local restrictions, the maximum permissible sectional speed is 55 m.p.h./90 Km. p.h. for the E.M.U's.

(c) On the section, the Automatic Block System is in force with 3 aspect Colour Light Signals of the multi-unit type, except at such locations, which are few, where manual and semi-automatic signals are necessary for protection of cross-overs and level crossings. On the automatic signals, 'A' marker boards are provided. On semi-automatic signals, the 'A' marker indication lights up when such signals are worked as automatic. Semi-automatic signals protecting level-crossings are provided with 'G' marker boards in addition to the 'A' marker indication lights.

(d) The relevant distances from the centre of Vadala Road station building, north of which the collision occurred, were measured to be :—

(i) Commencement of 2,292 feet radius left hand transitioned curve	50 Feet (South of Station Building)
(ii) Down starting colour light signal No. H. D./HE1 with 'A' marker and 'G' Board	187 Feet.
(iii) Interlocked level crossing No. 3 provided with lifting barriers	805 Feet
(iv) Tail end of B. 19 Down	1,391 Feet.
(v) Probable point of collision (Tail end of M. 9 Down)	1,948 Feet.
(vi) Interlocked level crossing No. 4 provided with gate shutters	2,068 Feet.
(vii) End of 2,292 feet radius left hand curve	2,480 Feet.
(viii) Front end of M. 9 Down	2,520 Feet.
(ix) Ravli Jn. Routing Signals 1 & 2	2,745 Feet.
(x) Ravli Jn. Cabin	3,611 Feet.

The $2\frac{1}{4}^\circ$ left-hand curve is 2530 feet in length, and the grade from 700' in advance of Vadala Road to beyond the RVJ/1 & 2 signals is 1 in 650 rising.

11. The Signalling Section.—(a) The signalling section on which the accident took place is from signal No. HD1/HE1D, known as the Vadala Road down starting signal, to Ravli Jn. route indicating bracketted signals 1 & 2. The length of this signalling section, i.e. the distance between the said signals is 2557 feet, less than half mile. There are two level crossings on the signalling section, protected by signals, which in the down direction are—

- (i) Interlocked Level crossing No. 5 with electrically operated lifting barriers. The Ground Frame thereat is designated HD—referred to as G. F. HE.
- (ii) Interlocked Level crossing No. 4 with gate shutters and mechanical locking. The Ground Frame thereat is designated HE—referred to as G. F. HE.

In the down direction, the VDLR signal is the gate signal for both level crossings No. 5 and No. 4.

(b) The lifting barriers and signals are operated from a Panel at G. F. HD at level-crossing No. 5, employing relay interlocking, by means of push buttons and switches. The Panel displays the position of lifting barriers, the approach of Up and Down trains, the signal aspects and the 'A' marker lights. The interlocking embodies the following features:—

(i) The gate signals cannot be cleared unless—

all track circuits in the signalling section and the over-lap ahead are clear the level crossing has been closed and locked against road traffic, and the signal switch operated to clear the signal; and

in the case of the down gate signal, i.e. the VDLR signal, level crossing No. 4 is also closed and locked against road traffic and signal control lever No. 1 of G. F. HE is reversed.

(ii) The 'A' marker lights do not light up unless—

the level crossing is closed and locked against road traffic and the signal switch operated to clear the signal; and

in the case of the down gate signal, i.e. the VDLR signal, level crossing No. 4 is also closed and locked against road traffic, and signal control lever No. 1 of G. F. HE is reversed.

(c) Ravli Jn. Cabin, located at Km. 10/3-4 controls the traffic at the 4-route junction i.e. the Harbour Branch lines to Kurla Jn. to Bandra on the Western Railway and movement to and from the Bombay Port Trust (B.P.T.) railway. The operation is on the electro-mechanical system. Movement on the Harbour Branch lines and the chord lines to Bandra is on the automatic block system. Movement to and from the B.P.T. railway is on the absolute block system. The layout at Ravli Junction is such that a down train from Vadala Road, bound for Kurla, must be held at RVJ1 signal during the passage of a down train from B.P.T. railway to Bandra or on Up train from Bandra to Bombay VT or to B.P.T. railway.

12. Train Working Rules.—(a) The normal signal aspect in 3-aspect automatic signalling territory is Green. The entry of a train into the track-circuited section ahead, one or more, places the automatic signal at Red i.e. Danger or 'ON'. The signal turns to Yellow when the train has cleared the 1st signal ahead and the overlap beyond, and again assumes the Green aspect when the train has cleared the 2nd signal ahead and the overlap beyond it. A semi-automatic signal is provided with both manual and track-circuit controls; when worked as an automatic signal, it assumes the Danger and Proceed aspects, according to the state of the track-circuit sections ahead, and the 'A' marker is lit.

(b) Significant Rules, concerning the case, are reproduced below :—

"G.R. 275— A : Automatic stop signals or semi-automatic when worked as automatic :—

Indication	Aspect	Significance
Green with 'A' Marker	Clear	Proceed at normal speed ; next stop signal is 'OFF'.
Yellow with 'A' Marker	Caution	Proceed and be prepared to stop at the next stop signal.
Red with 'A' Marker	Danger	Stop.

"G.R. 277—Driver's duty when Automatic Stop Signal is 'ON'—When a driver finds an Automatic Stop Signal with an 'A' marker at 'ON', he must bring his train to a stop in the rear of that signal. After bringing his train to a stop in the rear of the signal, the driver shall wait there for one minute by day and two minutes by night. If after waiting for this period, the signal continues to remain at 'ON', he shall give one long whistle and exchange signals with the guard and then proceed ahead, as far as the line is clear, towards the next stop signal in advance, exercising great caution, so as to stop short of any obstruction.

Where, owing to the curvature of the line, fog, dust storm or other causes, the line ahead cannot be seen clearly, the driver shall proceed at a very slow speed, which shall, under no circumstances, exceed five miles/8 kilometres per hour. The driver, if he considers it necessary to have assistance, may call the guard by giving a prescribed code of whistle.

S.R. 277-1—The 'ON' position of an Automatic Signal may be due to the presence of a train in the Automatic Signalling section ahead including the overlap or due to an obstruction on the track or a broken or a displaced rail or any other cause. When a driver passes an Automatic Stop signal at 'ON', he must, therefore, proceed at a speed that will enable him to stop short of any obstruction.

"G. R. 279—Precautions after passing Automatic Stop Signal at 'ON'.—When an Automatic Stop Signal has been passed at 'ON' the driver shall proceed with great caution until the next stop signal is reached. Even if this signal displays 'Caution' or 'Attention' or 'Clear' aspect the driver must continue to look out for any possible obstruction short of the same. He shall proceed cautiously upto the signal and shall act upon its indication only after he has reached it.

S. R. 279-1—The indication of an Automatic Signal applies only to the track beyond the signal and there is possibility of a train standing inside the signal while it is showing 'OFF'. A Driver having passed an Automatic signal at 'ON' must not therefore act on the indication of the Signal ahead until he has actually reached it."

V. TESTS AND OBSERVATIONS

13. **The Signalling.**—On 28th June, after the down line was cleared, functional tests on the working of the signalling section between Vadala Road and Ravli Jn. Cabin were carried out. The results were as below :—

Test No. 1 :	Conditions	Track circuits HD/HE ₁ T, HD/HE ₁ AT, RVJIT clear. Gates for level crossing No. 4 closed and lever No. 1 of G.F. HE thereat reversed. Signals RVJ/1 and RVJ/2 maintained at ON. Barriers of level crossing No. 5 open to road traffic.
	Operation	Switch on the panel for VDLR signal HD ₁ /E ₁ at G.F. HD at Level-crossing No. 5 changed to 'OFF'.
	Observations	Signal HD ₁ /HE ₁ showed Red and 'A' marker not lit. Red indication on panel and no 'A' light indication for signal.
Test No. 2 :	Conditions	Same as Test No. 1, but with barriers at level crossing No. 5 closed to road traffic.
	Operation	Switch for signal No. HD ₁ /HE ₁ changed to 'OFF'.
	Observations	Signal No. HD ₁ /HE ₁ showed Yellow and 'A' marker lit. Signal indication on panel disappeared and 'A' Light indication for signal lit.
Note : Only the Red aspect of the signal is repeated on the panel at G.F.H.D.		
Test No. 3 :	Conditions and Operation	Same as Test No. 2 but with lever No. 1 of G.F. HE at normal.
	Observations	Same as for Test No. 1.
Test No. 4 :	Conditions	Same as Test No. 2 with signal HD ₁ /HE ₁ showing Yellow.
	Operation	Track circuit HE ₁ shorted.
	Observations	Track and signal relays dropped. Signal HD ₁ /HE ₁ showed Red with 'A' marker lit. Red indication and the 'A' lit on panel at G.F.H.D.
	Operation	Short on track circuit HE ₁ removed.
	Observations	Aspects reappeared as before.
Test No. 5 :	Conditions	Same as Test No. 2 with signal HD ₁ /HE ₁ showing Yellow.
	Operation	Track circuit HD/HE ₁ shorted.
	Observations	Same as for Test No. 4.

	Operation	Short on track circuit HD/HE ₁ removed.
	Observations	Aspects reappeared as before.
Test No. 6 :	Conditions	Same as Test No. 2.
	Operation	Signal RVJ/1 cleared to Green.
	Observations	Signal HD/HE ₁ showed Green with 'A' marker lit. 'A' indication on panel at G.F.H.D. remained lit.
Test No. 7 :	Conditions	Same as Test No. 2.
	Operation	Signal RVJ/2 cleared to Yellow.
	Observations	Signal HD ₁ /HE ₁ showed yellow with 'A' marker lit. 'A' indication on panel at G.F.H.D. remained lit.
Test No. 8 :	Conditions	Same as Test No. 7.
	Operation	Bandra-bound down train started from Vadala Road.
	Observations	Signal HD ₁ /HE ₁ changed to Red as soon as signal was passed and 'A' marker remained lit. On panel at G.F.H.D., Red indication appeared and 'A' indication remained lit. After the train cleared track circuits HD/HE ₁ T, HD/HE ₁ AT and RVJ ₁ T, signal HD/HE ₁ changed to yellow with 'A' marker lit; on panel at G.F. H.D., the Red signal indication disappeared and the 'A' light indication remained.

14. **Braking Gear of No. B. 19 Down.**—The colliding train comprised Units No. 47 and No. 38, the second from the leading end of each 4-coach set being motored. The units which were hauled into Kurla Car Shed were tested on 29th June.

Motor-coach No. 8547 of Unit No. 47 was damaged in the accident and it was not possible to test the exhaustor which, according to records, was overhauled on 16-5-66. The motor of the exhaustor could however be worked.

The exhaustor of motor coach No. 8538 of Unit No. 38 was over-hauled on 10-1-66. The exhaustor was worked and it took 28/37 seconds to create 17/18 inches vacuum in Unit No. 38.

With one cylinder of trailer coach dummied a number of braking distance trials were carried out in the Car Shed with Unit No. 38. From an initial speed of 40 Km. p.h., full application of brakes could stop the Unit in a distance of 85 metres, i.e. about 280 feet, in 12.5 seconds. The average deceleration was 1.69 m.p.h/second against the original acceptance of 1.89 m.p.h/second.

15. **Braking Distance Trials.**—A series of tests were carried out with a train of similar composition and type to No. B. 19 Down on the main suburban sections making full brake application by the release of the dead man's handle. The results, not allowing for the motorman's reaction time, were as follows :—

From Speed	Distance to stop	Time
(i) 10 Km.p.h.	7 Meters = 23 Feet	6.5 Seconds.
(ii) 15 Km.p.h.	26 Meters = 85 Feet	8.0 Seconds.
(iii) 20 Km. p.h.	36 Meters = 118 Feet	11.5 Seconds.
(iv) 30 Km. p.h.	63 Meters = 207 Feet	13.9 Seconds.
(v) 40 Km. p.h.	95 Meters = 312 Feet	16.0 Seconds.
(vi) 50 Km. p.h.	138 Meters = 453 Feet	18.0 Seconds.

16. Speed Trials on the Signalling Section.—Bandra bound trains from Vadala Road have necessarily to observe a speed limit of 15 Km.p.h. on the turnout curve at Ravli Jn. On the hypothetical consideration that signal RVJ/2 would also show Yellow if the Vadala Road, Down signal indicated Yellow, and the motorman of Bandra bound train starting from Vadala, Road "takes this for granted", speed trials were carried out on the signalling section with a train, of similar composition to B. 19 Down. The results were as follows :—

Location	Speed attained	Time
Vadala Road	Zero	Zero
L-Xing No. 5, E.S. 9/9-10	37 Km. p.h.	30 Seconds.
E.S. 9/19-20 (Site of Collision)	49 Km. p.h. (Maximum speed attained on the section)	56 Seconds.
E.S. 9/24 (Ravli Jn. down routing signals)	41 Km. p.h.	76 Seconds.
E.S. 10/6 (Turnout Ravli Jn.)	12 Km. p.h.	112 Seconds.

17. Visibility on the Signalling Section.—On 7th July, a black cloth profile, sized to a train's cross-section, was fixed on the down line at the place of collision, E. S. 9/19-20. I approached it from Vadala Road in a down train of similar composition to B. 19 Down, travelling in the driving cab with the motorman of the "offending" train. The visibility of the track on the long left-hand 2,292 feet radius curve was restricted at various places by hutments and road-side structures to the left.

The profile first came into view only after passing level crossing No. 5 but one could not be sure whether it was on the Down line or the Up line. The profile, however, was very clearly visible to be on the down line from a position near-about 700 feet in rear of it, and there was nothing in this range to impair its continued visibility. Braking tests showed that with full application and release of the dead man's handle the train could be stopped in 150 feet/80 feet from an initial speed of 25 Km.p.h./15 Km.p.h.

VI. EVIDENCE

18. Guard Y. R. Bhat of M. 9 stated that the train was stopped at 07.54 hours in rear of RVJ/1&2 signals which were at danger. Having waited for 5 minutes, he alighted to 'protect' the train on the rear side in accordance with G. R. 280 and S. R. 280-r. From a distance of 2 E. S. he saw signal RVJ/1 turn to green, whereupon he hurried back. As he got into the cab he observed B. 19 approaching him at speed. He jumped off and ran towards the approaching train showing danger signal to the motorman, but in vain. He was about 1 E. S. when B. 19 Down passed him and collided.

To questions, the witness said : RVJ/1 signal was taken off at about 08.02 hours as far as he could judge ; the collision occurred at 08.05 hours according to his watch which was set to the control time; B.19 showed no sign of slowing down; and he did not see its motorman jump out before the accident. He met the motorman of B.19 Down at the site, but realising his condition, he did not ask any question.

19. Motorman S. P. Saxena of M.9 stated that after stopping 1 minute at Vadala Road he left on the Yellow aspect of the signal with "A" lit at "07.49 hours" and stopped in the rear of RVJ/1&2 signals which showed Red at "about 07.52 hours". He observed at the junction a down goods train from B. P.T. Railway proceeding to Bandra and later a local from Bandra to Vadala Road on the Up line. At "about 08.04 hours" RVJ/1 signal showed green for him to proceed towards Kurla Jn. on which he gave 2 beats to the guard who did not respond. A few seconds thereafter, he experienced a push to his train, and on looking back he realised "that the B.19 Down had bumped into my train". He rushed to the rear of his train and met the motorman of B.19 Down who looked "all right".

He accompanied the motorman of B.19 to Vadala Road station as he was "in a nervous state and mentally disturbed... and expressed fear of being mobbed by the crowd". Regarding his conversation with motorman of B.19 he said : "About the signal aspect at Vadala Road, he seemed to be very incoherent. He first told me that it showed Red with "A" marker. Then he told me that it was Yellow with the "A" marker light. He was sure that he was travelling at a very slow speed".

To questions, the witness said : he stood with the front of his train "about 60 yards" in rear of RVJ/1&2 signals with brakes released; the interval between his drawing the guards attention to proceed and the impact "was not less than 30 seconds and not more than 45 seconds" as far as he could recollect; and before his guard left the cab to 'protect' the train, "he had drawn my attention and I exchanged hand signals with him and I also saw that he got down with a red flag in his hand".

20. Guard R. G. Chaturvedi of B.19 stated that the train left Bombay VT station on time and after stopping at various stations *en route* reached Vadala Road at 08.00 hours. As the VDLR signal showed Red, his motorman gave the specified beats on the bell signal, on which he alighted and walked up half the length of the train and saw the "A" marker lit. He then hurried to his cab and on acknowledging the beats, the train started at 08.03 hours. He was quite sure that he continued looking at the signal to the time the train started and sometime thereafter, and it showed Red.

To questions the witness said : he had set his watch to the control time at VT; the run from VT was normal and the "B.19's" brake-power was adequate; the motorman was driving cautiously after passing Vadala Road and he was on the left side in his cab in the direction of travel to the time the accident occurred but could not see the front end of the train because of structures on the left side of the left-hand curve. Chaturvedi asserted that the motorman whom he met at Bombay VT was in "perfectly sober condition and quite alert"; he felt that a full application of brakes was made before the collision; and as the train was moving at a slow speed, he did not consider it necessary to draw the attention of the motorman, having in mind that danger signals would be shown by the gatemen at the level-crossings. He saw no gatemen at Level-crossing No. 5 exhibiting a danger signal.

After the accident at 08.05 hours he made sure that the Up line was not fouled of actual moving dimensions; and in fact, he saw B. 24 Up standing on it. He met R. U. Vanjani, his motorman, while proceeding to the place of collision and told him that having proceeded on Red signal with "A" marker from Vadala Road, "he should have been vigilant and cautious". Chaturvedi continued to say that the motorman "admitted that he had passed the Vadala Road signal at Red with "A" marker light, but due to curvature he could see the train ahead very late. I asked him how he saved himself to which he replied that he jumped off his cab before the collision... Motorman Vanjani was in a nervous state and very disturbed mentally. He told me that he was hurt on one of his hands. He then hurried to Vadala Road station. About one hour after the accident, while I was at the site, motorman, Vanjani met me. He suggested to me, almost to the extent of pleading, that I should say in his defence that the Vadala Road signal was indicating Yellow at the time he started the train. I told him that I had seen the signal at Red and that I will not give any false evidence in his defence. Thereupon he got annoyed and went away".

21. Pointsman M. D. Dhuri, on platform duty at Vadala Road, stated : "At about 08.00 hours, B.19 arrived on Platform No. 1, at which time the Down Starter was displaying 'red' aspect with the "A" Marker burning. The aspect of the Down Starter Signal remained 'red' for 2 minutes and then I went to the S. M's Office and enquired as to why the signal did not come "off." While the S. M. was telephoning to the level crossings ahead to ascertain why the VDLR signal showed red, the train had already left. He was about 4 coaches from the front end of B.19 when he saw the VDLR signal at Red with the "A".

22. Instrument Technician, R. K. Koyande of the Atomic Energy Establishment, Trombay, a passenger on B.19, stated that at about 08.01 hours he stepped into a IIIrd Class compartment in the 3rd coach at Vadala Road with a friend and both stood on the left side of the train. He possessed monthly season ticket No. 36744, available between Bombay VT and King's Circle/Matunga, valid upto 18-7-1966. He said : "We could clearly see that the starting signal at Vadala Road was Red. We thought that the signal must have been out of order and the driver

was allowed to proceed by the station staff. As the regards train proceeded, we could see the Mankhurd train ahead of us on the same track. I was standing there and we could see it from a point about one furlong in rear of it. We thought that the driver of our train would stop the train, but contrary to our expectations, the train continued to move at the same speed as if a blind man was driving it and it collided with the train ahead. I got an injury which was very slight on my right cheek bone".

23. S. S. Vairal, working in the Diamond Gas Company, Bandra, a passenger on B.1 who got into the 1st compartment of the leading coach at Dockyard Road, stated : "I was standing at the door and I could see that the signal was Red. The train started and was gaining speed and I moved away from the door. Some of the passengers from my compartment, began to shout that there was some train ahead and our train must stop. I therefore came near the door and saw a train ahead and I was thrown out. I sustained injury to my right hand and forehead and on my back side. When I saw a train in front of our train, I noticed someone showing a red flag to our train. When I noticed the train ahead, the distance between the two trains was about 100 feet and my train was not in speed".

To questions, Vairal said that the VDLR signal continued to show Red upto the time his compartment passed it, and "the two top lenses were not showing any light but below the red light I saw the letter "A" and this was white".

24. Gatemen S. U. Mashak and R. K. Brankar of level crossing No. 5 stated : "First train Mankhurd of 07.49 hours was standing across Gate No. 4. The approach track was indicating the approach of a Down Local. We closed the gate and gave the signal. "A" Marker light was burning. When we saw the train approaching the gate, we showed 'red' flag towards the motorman and warned him by shouting but the motorman passed the gate at a high speed. The indication of the Down Signal on our panel box was "red" with "A" Marker light burning".

25. Gatemen P. Massoo and M. Ziloo of level crossing No. 4 stated that M. 9 stopped at RVJ/1 & 2 signals ahead, which were at danger, with part of its rear end on the level crossing. After some time, on observing B.19 approaching the level crossing "at usual speed, we both ran towards the train with 'red' flag to stop the same, but the said Local collided with the stationary Mankhurd Local". To questions, the witnesses said that a few seconds before the accident, they saw the guard of M.9 get down from his cab with hand signal flags and that they were near the tail end of M.9 when the accident occurred.

26. Motorman S. N. Ahluwalia of B.24 Up stated that after some detention at King's Circle, he passed Ravli Jn. at about 08.03 hours towards Vadala Road. While he was passing M.9 that was stationary on the down line, he saw the B.19 collide with it, whereupon he made a full application of brakes and stopped with the front end of his train at E. S. 9/18 i. e. about 3 coaches forward of the site of collision.

After the accident, he met the motorman of B.19 and made enquiries. He said R. U. Vanjani "was in a nervous and perplexed state and he could not tell anything. I also met Chaturvedi guard of the colliding train and he told me that the train had passed Vadala Road down signal at red with "A" marker light under it. I also met the guard of the standing train Shri Y. R. Bhatt who was also very nervous with both flags in his hand and he told me that he had made an attempt to protect the train and stop the train that collided with his train".

Asked what speed he could attain on the signalling section if he started from Vadala Road on the VDLR signal at Yellow, he said "I have to assume that the Ravli Junction signal would be red. It is only after I see the Ravli Junction signal at yellow that I would proceed. In any case I would observe 10 miles speed at Ravli Junction. Thus at Vadala Road I would start 'in series' and after attaining a speed of 15 miles per hour, I would coast upto Ravli Junction. I would never go into parallel. Thus I would never attain a speed of more than 15 m.p.h. at the most about 20 m.p.h."

27. Traction Train Examiner S. A. Patil stated : "Set No. 'C' Train No. B. 105, Unit Nos. 47-38, was stabled at Bandra Depot at 23.28 hours on 27-6-66. As per standing instructions I examined this rake and gave it fit for service. This rake left as B. 10 Up at 05.34 hours right time on 28-6-1966. This rake was worked as B.19 Down from VT on the day of the accident which occurred near Ravli Junction Cabin".

To questions on brake-work attention, the witness detailed the tests carried out with his fitter and 3 khalasis and said : "Before it was given for service at Bandra, I had made the necessary brake gear adjustments on the brake beams. There was no brake block that had reached condemned size, otherwise I would have replaced the same". A vacuum cylinder of coach No. 8222 was the only one found defunct, and all others were tested to satisfaction. He had not received any memo from the motorman who worked the rake before it was stabled at Bandra on the night of 27th June.

28. Motorman H. Dey who worked the rake as B.11 Down from VT to Bandra and as B.20 Up from Bandra to VT just prior to the same rake being worked as B.19 Down on 28th June, stated : "I had no trouble in both directions by B.11 Down and B.20 Up which were worked with the same rake. However, I noticed while stopping at Masjid in the down direction with B.11 down that the brake power was sluggish but I had no difficulty in stopping the train at all halts in both directions by greater application of brakes". On close questioning, the witness said : "I did not consider the sluggishness of the brake power so important that the rake could not work to Bandra. By "sluggish" I mean that the brake power was such that the train could normally work, but the motorman has to be more careful. I mean that the braking on the train was in working order and the rake could work to Bandra but the motorman would have to be cautious. . . . I may add that at Bandra I had to stop for 10 minutes. On my way back from the leading end to the other, I did notice the brake blocks and did not find anything unusual".

29. (a) Motorman, R. U. Vanjani, who worked B. 19 on 28th June, stated he left Bombay VT to schedule, stopped at Masjid, Sandhurst Road, Dockyard Road, Reay Road, Cotton Green and Sewri stations and reached Vadala Road at 08.00 hours, i. e. 1 minute before time. After 2 minutes stop, he left Vadala Road and said that—

- A. VDLR signal showed Red with "A" marker, on which he exchanged bell-signals with the guard, and, after his train started moving, he saw the VDLR signal at Yellow; and
- B. From Level Crossing No. 5 he saw a train which he realised to be on his own line, i. e. the Down line, as he approached nearer, and he "switched off and jammed the brakes but before I could fully control the train, it collided into the train which was standing ahead".

(b) At the time the accident occurred, he was in his cab and "noticed that the roof over my head and side panels around me had damaged, and I was trapped inside. I was conscious at this time. After some time, some passengers came and removed the damaged partition of the bogie, and I could then come out through the compartment. I then started on my own to Vadala Road station for first-aid". About 20 yards from the obstruction, he had seen the guard of M. 9 jump off his cab shouting to me to stop the train. . . . I could hear his shouting. . . . he had raised one of his arms with a view to stop my train".

(c) After the accident :—

- (i) He met motorman Saxena of M.9 "at the middle of my train as I was walking on the off-side, i.e. down side of down line. He asked me about the details What I actually told him, I do not remember at all I also met my guard at a point one or two bogies from his cab. He did ask me how the accident occurred. I was in a dazed state of mind and I did not say anything I definitely remember that I did not meet the guard of M.9 . . . I did not meet any gateman or station master of Vadala Road".
- (ii) He said he was "extremely upset . . . I reached Vadala Road Station on foot in ten to fifteen minutes after the collision. I do not remember who was there that was giving first-aid to some passengers. I also required first aid, so they applied tincture iodine on my legs and left shoulder where I was hurt. . . my wounds were not bleeding . . . after the collision, I thought that passengers on the train might hurt me and that is why I did not reveal my identity . . . somebody, whom I do not remember, told me that I was required by the Divisional Electrical Engineer, Shri C. K. Thakkar, at the site. I walked upto the site where Shri Thakkar asked me some questions".

(d) Regarding the aspect of VDLR signal, the witness, who was conversant with Instructions in the General & Subsidiary Rules for working trains in Automatic Signalling sections, said : "My cab was on the platform and the signal was about 20' ahead of me . . . As I was notching up on the master controller and had gone upto about the third notch, I saw the signal turn to Yellow. I then came on the sixth notch and maintained it at "series". I did not go into 'parallel' at all before the accident". He could not remember to have seen the 'A' marker when he saw the signal change to Yellow. He could not say at what distance he was when he saw the VDLR signal change from Red to Yellow after he started the train.

After the accident, he passed VDLR signal on 2 occasions on foot, but he did not look at its aspect as he was "in a dazed state of mind". To a suggestion, it was but natural tell his colleagues that he passed VDLR signal at Yellow, specially the guard of his train, he stated : I was not in a position due to my injuries and my state of mind to tell any one about this".

Vanjani did not consider it necessary to call for the guard's assistance before starting the train on VDLR signal at Red, "because the view ahead from Vadala Road was clear . . . and I would have negotiated the train myself on the curve at very low speed, but after I started and notched the master controller to the third notch, the signal showed Yellow so I proceeded cautiously again".

(e) Regarding his inability to control the train on the section, the witness said : "The speedometer provided in the cab was not in working order . . . the braking on the train was in working order but the efficiency was not as powerful as expected . . . I could, however, work the train without any risk or mishap and that is why I did so working it very cautiously. . . after a little while, I became aware that the standing train was on my line i. e. the down line when I was about 75 yards from its tail end as far as I can recollect. Immediately I observed the obstruction, I released the dead man's handle and brought the vacuum to zero. My train, however, collided with the stationary train at a very slow speed which I think was three to four miles per hour". When the obstruction came into view and he was sure that it was on his line, he "could adjudge the speed to be about 10 m.p.h. certainly not more than 10 m.p.h." To a question in what distance he could bring an 8-coach train to a stop with normal brake power on level grade from 10 m.p.h./5 m.p.h., his reply was about 75 yards/about 25 yards.

(f) To further questions, Vanjani said :

"God has saved me . . . my speed at the time I collided was only three to four miles per hour and that is why I thought nothing would happen." He was alert and had no worry on his mind. He maintained that he was in the driving cab at the moment the accident occurred.

Asked to describe the VDLR signal, he said : "The lenses were three, one for green, one for red and one for yellow. In addition there was the lens for 'A' marker light and a 'G' board below the 'A' marker light. The lenses are one above the other. In my present state of mind I cannot say which lens shows which light. My mind has been badly affected after the accident".

He denied having told the Divisional Electrical Engineer at site that he had started on the VDLR signal Red with "A" and said : "I rember to have told the Divisional Electrical Engineer, and I am sure I told him, that I started on the red signal with 'A' marker light from Vadala Road, exchanged four-pause-four beats with the guard, and as I moved the train, I saw the yellow aspect. I also mentioned that I worked the train in 'series combination', and when I saw the obstruction ahead I released the deadman's handle and jammed the vacuum".

In case the section ahead was unoccupied and the VDLR signal displayed a Yellow aspect for a Bandra bound train, he said he would, on starting from Vadala Road, "go into series along the curve until I see the Ravli Junction Down Routing signal. If that showed Yellow for the Bandra line, I would go into parallel, and then switch off before the signal because I have to observe a speed of 10 m.p.h. on the turn-out at Ravli Junction to proceed to Bandra . . . If I did sight the signal in time and go into parallel, the maximum speed I will attain before I switch off power would be of the order of only 25 m.p.h. This is very approximate".

30. Station Master M. S. Subbiah of Vadala Road stated that on receipt of intimation of the accident from gateman of level crossing No. 4 at 08.05 hours he sent out emergency calls to the Fire Brigade at Dadar, the hospitals at Sion and Byculla and informed the Control office at Bombay. He reached the site at 08.15 hours and observed the Fire Brigade busy with rescue and relief operations.

He was in the station office at the time B.19 left Vadala Road, telephoning to the gateman of the level crossing No. 5 to ascertain why VDLR signal showed red having been informed personally by the platform pointsman about its aspect. While proceeding to the scene of the accident, he had observed the VDLR signal displaying the Red aspect.

31. Assistant Station Master T. M. Verghese of Ravli Jn. Cabin stated : Panoli goods train from B. P. T. railway passed Ravli Jn. towards Bandra at 08.00 hours the B.24 Up local train passed the junction at 08.01 hours and at 08.02 hours RVJ/1 signal was cleared for M.9 which was detained thereat since 07.54 hours. At 08.03 hours he was informed of the accident by the gateman of level crossing No. 4. He then advised the control at Bombay.

NOTE.—The control office record shows that intimation from Ravli Jn. was received at 08.10 hours. The witness, however, said that the cabin clock showed the same time as Control's when verified at 09.00 hours.

32. Divisional Electrical Engineer, Traction Rolling Stock, C. K. Thakkar stated that he reached the site at about 08.45 hours. After a rapid survey of the situation, he questioned motorman R. U. Vanjani of B.19 who "verbally mentioned that he started from Vadala Road on Red signal with "A" Marker indication and while negotiating the left hand curve he realised too late that there was M.9 Down standing on the section. He released the Dead Man's Handle but the collision occurred. I found him injured. I asked him to give him statement in writing but due to his condition he was unable to do so. I left him in the care of doctors who took him away".

33. Assistant Signal & Telecommunication Engineer S. K. Sinha reached the site at 08.50 hours and recorded necessary particulars jointly with Assistant Transportation Superintendent Suburban, V. K. Shukla. He stated that "the relay cabinet of level crossing No. 5 and all the apparatus cases between Vadala Road and Gate No. 4 were sealed with the station seal in the presence of Shri Shukla, ATS (Sub) and myself. We completed the sealing at 09.45 hours. We sealed Locations Nos. 534A, 534, Gate No. 5 Relay apparatus case and H 604". After the down line was cleared, he assisted in carrying out tests on the signalling section.

NOTE.—The seals were broken in my presence at about 11.00 hours for inspection; the cases housing the apparatus were then relocked.

34. Electrical Signal Maintainer E. V. Mathews, posted at Ravli Jn. Cabin said that when he took over charge at 07.00 hours on 28th June, there was no entry of any failure or equipment requiring attention. In the course of maintenance, he had inspected the installations at level crossing No. 5 on 26th June and found nothing defective.

35. Signal Inspector J. C. Menzes stated that on 21st June he had inspected the Sewri-Vadala Road-Ravli Jn-King's Circle section on foot and found no defect. He said that since 14th June there was no reported failure of any equipment at Ravli Jn. or level crossings No. 4 and No. 5.

36. Fire Brigade Officer N. V. Chitnis, stationed at Dadar, received the rescue-service call at 08.09 hours. With 2 fire engines and one ambulance he reached the site at 08.13 hours. He said : "I requisitioned for 8 Crews (Fire engines) and as many ambulances as possible for help. On entering the train I gave orders to my crews to remove the injured persons to hospitals in our ambulance. Meanwhile, other ambulances from other Fire Stations arrived who were also directed to remove injured persons to hospitals. A thorough search was made of the wrecked portion of the trains but no one was found trapped. Most of the injured persons were removed to hospitals in Fire Brigade ambulances. . . . My chief Officer Shri Fredellis reached the site soon after my arrival and took charge of the rescue operations. In about 45 minutes, all the injured were sent away from site in ambulances".

To a question he said that had the motorman of B.19 been in the cab, "he would have been very badly trapped and I would have had to rescue him. When I examined the wreckage he was not in the cab, although the cab was damaged very badly".

37. Divisional Medical Officer Dr. D. R. Chopra reached the site at about 09.00 hours after making arrangements for the ambulance with doctors and staff from the hospital at Byculla to proceed. He rendered a succinct account of the rescue and relief work done by the Railway and non-railway organisations. He escorted motorman Vanjani who was injured and admitted him into the railway hospital at Byculla.

VII. DISCUSSION

38. **Time of the Accident and Visibility Conditions**—The guards of B.19 and M.9 Down suburban trains, who had checked and set their watches with the control time, noted that the Accident occurred at 08.05 hours—paras 18 and 20. The motorman of M. 9 Down observed the aspect of RVJ/1 signal turn to 'green' at 08.04 hours and, about 30 seconds later, felt the effect of the collision—para 19. Station Master, Vadala Road, received intimation of the accident from gateman of level crossing No. 5 at 08.05 hours—para 30.

Cabin Assistant Station Master, Ravli Jn., received intimation of the accident from gateman of level crossing No. 4 at 08.03 hours—para 31—and informed the Control Office which recorded this as 08.10 hours. Gatemen of level crossing No. 4 would have taken about 2 minutes to return to the bunk—para 25—to inform Ravli Jn. Cabin where apparently the clock was 2 or 3 minutes behind time.

It is to be accepted that the accident occurred a few seconds before 08.05 hours.

Testimonies show beyond doubt that the weather at the time of the accident was cloudy and the visibility was clear.

39. **The M. 9 Down Train**—(a) Measurements taken at the site—para 10 (d)—show that M. 9 Down stood with its leading end at least 225' in rear of bracketted signals RVJ/1 & and its 7th coach on level crossing No. 4. The place of collision was ES. 9/19-20, about 1950 feet north of Vadala Road station building. The train-working staff have said, and it is to be accepted, that M. 9 stood with its brakes released.

(b) The motorman of M. 9 who felt the impact could not say to what extent the train was pushed forward. Having proceeded on the VDLR signal at Yellow, he later coasted on the 1 in 650 Up grade and stopped "about 60 yards" from Ravli Jn. routing signals which showed Red — para 19. In the context of the case, it is deemed unfortunate that he did not move appreciably further to stop 30' or so in rear of the said signals.

40. **The Signalling**—The collision occurred on a section where the lines are fully track circuited, and automatic signalling of the modern type with 3-aspect multi-lens colour lights is provided. These have been designed to prevent, as far as possible, accidents arising from human errors, but cannot prevent an accident resulting from failure to obey the Stop and Proceed with Caution rules — para 12.

I was satisfied that the tests carried out—para 13—accorded entirely with the design and working functions of the signalling section between Vadala Road and Ravli Jn. Conditions at site did not warrant further tests on the track and signal relay circuits or the effect of extraneous current on the VDLR signal.

41. **The B. 19 Down Train**—Evidence shows that the 8-coach rake, Units No. 47 and No. 38, which worked as B. 10 Up from Bandra to Bombay VT, as B. 11 Down from VT to Bandra and B. 20 Up from Bandra to VT in the early hours of 28th June, had no defect that warranted attention—paras 27 and 28. The same rake was worked as B. 19 Down from Bombay V.T. by motorman Vanjani who observed 7 scheduled stoppages upto Vadala Road. According to him the brakes of the train were in working order, although the "braking efficiency was not as powerful as expected". The guard of B. 19 observed nothing unusual from Bombay VT to Vadala Road, the run between stations and stoppages thereat being normal. The train reached Vadala Road at 08.00 hours, 1 minute before schedule.

Unit No. 47 being damaged in the accident, the brake power of Unit No. 38 was tested on 29th June in Kurla Car Shed. The brake-work showed no defect: Unit No. 38 could be stopped in 280 feet from a speed of 40 Km. p.h. by emergency application of brakes—para

There could be little doubt that the condition of Units No. 47 and No. 38 was satisfactory and there was no defect which could have impaired their road worthy condition prior to the Collision.

42. Speed at Collision—Motorman Vanjani averred that B. 19 Down was driven by him cautiously from Vadala Road towards Ravli Jn. He asserted that the speed of his train was "certainly not more than 10 m.p.h.", i.e. 16 Km. p.h., when he sighted the tail end of M. 9 Down "75 yards ahead of him". Thereupon he made a full application of brakes but collided with the stationary train at a speed of "3 to 4 m.p.h.". The speedometer in the cab not being in working order did not detract the motorman from judging the speed at which he worked the train.

From my own observations of the extent of telescoping, shown by photographs appended as Annexure* II, there could be little doubt that had the motorman been in the driving cab at the time of collision he might not have survived. In any case he would have been most grievously injured. He received no bleeding wound.

It is concluded that—

the speed at collision must have been of the order of 25 Km. p. h. ; and

motorman Vanjani jumped off the cab before the impact—the guard of B.19 said that the motorman confessed to him of having done so, vide para 20.

43. Speed of B. 19 on Section—The signalling section between Vadala Road and Ravli Jn. is less than half mile in length for down traffic.

Motorman of B.19 asserted that he was driving the train cautiously—paras 29 (e) and 42. Guard of B.19 stated that the train was driven cautiously; if it was not, he had in mind that gatemen at the level crossings would exhibit danger signals—para 20.

Technician R. K. Koyande, a passenger on B. 19, stated that the M. 9 could be seen a furlong ahead but the motorman of B. 19 continued at "the same speed as if a blindman was driving"—para 22. He could not state the actual speed at collision.

Gatemen of Level Crossing No. 5 showed danger signal to motorman of B. 19 when they saw the train approaching "at a high speed"—para 24. Gatemen of Level Crossing No. 4 state that they observed B. 19 approach "at usual speed" and they ran towards it with danger signal—para 25.

Evidence is against the B. 19 Down being driven cautiously. On consideration of speed trials carried out in the signalling section para 16 I hold the view that the maximum speed attained by B. 19 between Vadala Road and E. S. 9/19-20, the place of collision, must have been at least 30 Km. p.h.

Trials on 7th July in company with motorman Vanjani para—17—established beyond doubt that the tail end of M. 9 Down would have been clearly observed by him from a point 700 feet in rear of the obstruction, i.e. had he been vigilant. Allowing even 3 seconds as motorman's reaction time, and on the assumption that he was to bring his train to a stop from a speed of 30 Km.p.h. even 35 Km.p.h.—paras 26 and 29 (f) there could be no doubt that he had ample range to stop the train clear of the obstruction—para 15 & 17.

It is concluded that Vanjani was either over confident or his attention had veered. When I tried to convince him about the factual position at site, he mentioned that he was keen to sight RVJ/2 signal and missed the obstruction which he observed too late.

44. Aspect of VDLR Signal for B. 19 Down—(a) The B. 19 left Vadala Road after stopping thereat for 3 minutes. There is no dispute that the VDLR signal showed Red with the 'A' marker lit when the train started.

*Not reproduced.

Guard of B. 19 Down who made sure that the signal showed Red with 'A' marker lit continued looking at the signal upto the moment the train started and sometime thereafter, and there was no change in the aspect. After the accident, motorman Vanjani pleaded with him that he should say that the VDLR signal showed Yellow at the time the train started—para 29.

Technician R. K. Koyande, passenger on B. 19, observed the signal aspect at Red from the time the train started upto the time the 3rd coach passed the signal—para 22.

Worker Vairal, passenger on B. 19, who was in the compartment adjoining the motorman's cab observed the signal aspect at Red from the time the train started upto his coach passing the signal—para 23.

Pointsman on platform-duty saw the signal at Red with 'A' and after 2 minutes went to inform the station Master. He did not see the aspect when the train left—para 21.

Station Master, Vadala Road saw the signal at Red when passing it on foot in 2 minutes or so of the occurrence of the accident—para 30.

(b) Motorman Vanjani of B. 19 said that after the train had started and he had operated the master controller to the third notch, he saw the signal, about 20' ahead of him, change from Red with "A" to Yellow but could not remember to have seen the "A" when it showed Yellow, nor from what distance he observed the change—para 29(d).

Divisional Electrical Engineer ascertained from motorman of B. 19 that he had left on VDLR signal at Red with 'A'—para 32. Motorman Vanjani, however, stated that he had informed the Divisional Electrical Engineer to the effect that he saw the signal at Yellow when he moved the train and had worked it on "series combination".

Trials on 7th July, in company with motorman Vanjani, indicated that after the master controller is notched to 1, the train moves and it takes 2 or 3 seconds to notch to 3. The VDLR signal, "about 20' ahead" is then obstructed by the left leading wooden upright of the driving cab. The factual position was brought home to the motorman who maintained that he did see the signal change from Red to Yellow and drove at cautious speed to stop at signal RVJ/2. The weight of evidence is against this ascertain.

45. Breach of Rules. — Motorman Vanjani did not require and therefore did not call for the guard's assistance when starting B.19 Down on VDLR signal showing Red with 'A'—para 29(d) —although the visibility was restricted on account of the long left-hand 2 curve. His declaration to have observed the VDLR signal change from Red to Yellow after the train moved has apparently been made in self-defence.

Inaction on his part to avert the collision, despite his own statement that he saw the obstruction 75 yards ahead of him when he was travelling at "certainly not more than 10 m.p.h.", at which speed he could have brought the train to a stop in 30 yards, even 35 yards, remains a mystery. It is evident that he was hardly vigilant and did not exercise adequate care, thus contravening the provisions of G. Rs. 277 and 279 and the S. Rs. thereunder—para 12 (b)—and of G. R. 76 reproduced below :

"76. Drivers to obey signals and to be vigilant and cautious.—(a) The Driver shall pay immediate attention to and obey every signal whether the cause of the signal being shown is known to him or not.

(b) He shall not, however trust entirely to signals, but always be vigilant and cautious."

NOTE.—In accordance with the procedure embodied in the Rules, quoted in para 12 (b), records show that the semi-automatic VDLR signal was passed at Red with or without the 'A' marker, on 32 occasions by down suburban trains in the period January to June 1966.

46. Pertinent Features — Relevant to the circumstances that led up to the accident, manifestly the result of Breach of Rules, the following features merit examination :

(a) The M. 9 stood with its leading end as much as 75 yards in rear of RVJ/1 signal.

It is considered that had M. 9 stood about 10 yards clear of the signal, the motorman of the "offending" train would have had greater margin in distance and time, and it is likely that the collision may not have occurred.

Although drivers are expected to stop as close to a signal-at-danger as possible — in automatic signalling territory, the visibility is very clear from as close as 15 feet — the optimum distance is not stipulated by any rule.

(b) Guard of M. 9 Down, which stood for more than 5 minutes at RVJ/1 signal, could not respond to the motorman's bell-beats for "30 to 45 seconds" as he had got off the cab to "protect" the train — para 18 and 19 — in accordance with the instructions in G. R. 280 and S.R. 280-1 reproduced below :—

"280. Protection of a train stopped in an Automatic Signalling Section.— When a train is stopped in an Automatic Signalling Section on account of accident, failure, obstruction or other exceptional causes, and the train cannot proceed, the Guard shall immediately check-up that the tail board/light is correctly exhibited and also exhibit a 'Danger' hand signal towards the rear. If the detention exceeds or is likely to exceed five minutes, it must be protected in accordance with rule 166, except that on the occupied line the detonators shall be placed as under :—

- (i) one detonator 90 metres from the train on the way out; and
- (ii) three detonators, 10 metres apart, not less than 180 metres from the train or at such distance as has been fixed by special instructions."

"S. R. 280-1 When a train comes to a stand in an Automatic Signalling Section and cannot proceed further due to a defect, obstruction or any other cause the driver will give one long and six short (—————000000) whistles; in the case of electric single or multiple unit trains, the driver will give one—six short rings to attract the attention of the guard and display a red flag by day, red light by night. The guard will acknowledge by waving a red hand signal and the driver will acknowledge the guard's signal by short whistles. The guard will then protect the train in rear in accordance with the provisions of G.R. 280."

At the site, no remnant of a detonator was found on any of the rails of the down line. There was no condition that required the guard to "protect" M. 9 Down. It is thus difficult to credit the combined testimonies of the motorman and guard in respect of the action stated to have been taken by the latter, presumably made in adherence to the words "or any other cause" in S. R. 280-1. It appears that the RVJ/1 signal turned to Green from Red only a few moments before the accident occurred.

Some guards of EMU's were questioned whether they took action in accordance with G. R. 280 & S. R. 280-1 if the stoppage under normal conditions behind a signal at Red exceeded 5 minutes. No such action had been taken at any time.

VIII. CONCLUSIONS AND REMARKS

47. **Cause of the Accident.**—On full consideration of the material, circumstantial and oral evidence, I have reached the Conclusions stated below:—

- A. (i) The Collision of 28th June 1966 was the result of B. 19 Down Suburban Train being driven without requisite care from Vadala Road towards Ravli Jn. when the signalling section ahead, less than $\frac{1}{2}$ mile in length, was occupied by the stationary M. 9 Down Suburban Train which had preceded it.
- (ii) Full responsibility for the Accident lies on the Motorman of B. 19 Down R.U. Vanjani who failed to exercise due precautions, as required by General Rules 277, 279 and 76, and Subsidiary Rules thereunder after passing the automatic colour light signal of Vadala Road at 'ON', whereat he had stopped for 3 minutes.

B. It is probable that the Accident would not have occurred had the M. 9. Down Suburban Train not stood with its leading end as much as 75 yards in rear of the Ravli Jn. routing signals.

48. **Service Record of the Motorman of B. 19 Down.**—I examined the service record of R. U. Vanjani, motorman of B. 19 Down. He has been working as motorman since October 1965. The record shows nothing significant in respect of train working duties.

49. **Relief Measures.**—Emergency calls were made without delay and they met with peremptory response. I am satisfied that the medical aid at site was prompt and efficient. All the injured were admitted in the Tilak hospital at Sion and the Central Railway hospital at Byculla well within 1½ hours of the occurrence of the accident. Relief measures and assistance were as satisfactory as could be expected in the circumstances.

50. **The "Stop and Proceed" Regulations.**—I have mentioned that on automatic signalling sections, a collision can occur as a result of failure to obey the Stop and Proceed rules—para 40. Incidentally, it is to be said that—

The Railway Board had recast Chapter XI of the General Rules and issued revised rules pertaining to the Automatic Block System *vide* their Notification No. G. S. R. 1352 dated 20-10-1959; and

Since the issue of the said Rules, the Railway Inspectorate have been urging for inclusion therein of certain provisions of the Old Rules regarding the procedure to follow when an automatic signal is to be passed at Danger.

With my letter No. 2749 dated 15th December 1962, I had sent to the 'Railway Accidents Committee—1962' a statement showing comparative procedures under the old and the revised Rules with suggestions. This statement is appended as Annexure* III. It is desired that the Rules which are current should be revised and made specific. In Annexure III, I have dealt with the General Rules. It follows that the subsidiary rules thereunder should be scrutinised and elucidations issued as necessary.

Yours faithfully,

Sd/- P. B. AIBARA

*Additional Commissioner of Railway Safety,
Western Circle, Bombay.*

Bombay,

Dated: 27th July, 1966.

NOTE.—The Motorman of B.19 Down Suburban Train Shri R. U. Vanjani, was sentenced to six months' rigorous imprisonment by the High Court, Bombay.

*Not Reproduced.

Recommendations made by the Commission of Railway Safety in connection with Collision of No. B. 19 Down Local Train with No. M. 9 Down Local Train between Vadala Road and Ravli Jn. Cabin on the Harbour Branch Electric Suburban of Bombay Division, Central Railway, at about 08.05 hours on 28th June, 1966.

1. Since the issue of the new rules contained in Chapter XI of the General Rules in 1959, the Railway Inspectorate had been urging the Railway Board to incorporate therein the provisions of the old rules regarding the procedure to follow when an automatic signal is to be passed at Danger. With his report on the Collision that occurred at Ultadanga Station, Eastern Railway on 4th December, 1960, Shri A. K. Gupta the then Additional Commissioner of Railway Safety, Eastern Circle, had made a special recommendation in this regard.

It is necessary that the 'Stop and Proceed' Rules of the Automatic Block System, Chapter XI of the General Rules, should be specifically revised to include certain safeguards, as suggested in para. 50 of the Report and Annexure III.

2. On sections worked on the Automatic Block System, it is necessary that a train should be brought to a stop as close as possible in rear of an automatic signal at ON so as to provide the maximum possible margin for a following train, driven cautiously, to stop clear of the train ahead. It is desired that instructions should be issued accordingly.

3. On the Electric Multiple Units, a red circle, 5 inches in diameter and about 4 feet above the carriage floor, serves as the tail-end protection by day - admittedly too small to be viewed by the driver of a following train, specially where the alignment is curved.

It is suggested that a 12 to 15 inches square tail-board, painted with cross-stripes in white on red background, should be provided and experiments carried out for anything more arresting e.g. a flasher-light.

NOTE.—Regarding Recommendation III, it is understood that 12" square turn over tail-boards to Drawing No. 2/E. M. U./C. R./063 are being fitted at one corner of the end panel of driving coaches. Hitherto the work has been completed on 140 such coaches. Work on the remainder is in progress.

Railway Board have remarked as under on the above noted recommendations

1. The revised General Rules for Automatic Signalling were brought into use only after taking into account the recommendations made by the Committee of Experts which went into the question of rules for automatic territories and also the various pros and cons in regard to safety, signalling, operation etc. On receipt of C. R. S's notings on the collision at Ultadanga station on 4-12-1960 the matter regarding the amendment of General Rules was carefully examined by this Ministry and their views were communicated to C. R. S. vide Office Memorandum No. 60-TTV/1/12 dated 10-11-1961.

The matter has been re-examined in the light of the C. R. S's recommendation. Board's views in respect of the A. C. R. S's recommendation on the General Rules 277 onwards are set out in the annexure enclosed (Not reproduced).

2. Accepted. Necessary instructions are being issued to all the Railways.

3. Accepted. The remaining Railways are also being advised for similar action in the matter.